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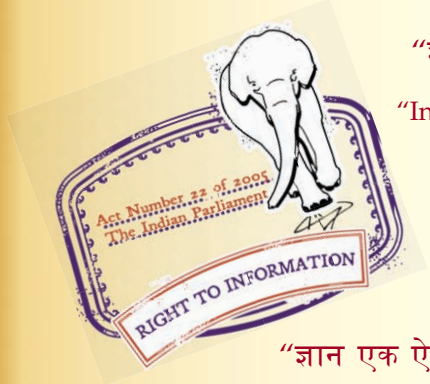
IS 4227 (1998): Texties - Braided nylon cords for aerospace purposes [TXD 13: Textile Materials for Aerospace Purposes]



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"Knowledge is such a treasure which cannot be stolen"

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IS 4227 : 1998
(Amalgamating IS 4437 : 1973)
(Reaffirmed 2003)

भारतीय मानक

वस्त्रादि — वायु आकाशीय प्रयोजनों के लिए गुम्फित नायलोन की रस्सी — विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

TEXTILES — BRAIDED NYLON CORDS FOR AEROSPACE PURPOSES — SPECIFICATION

(Second Revision)

ICS 59.080.50

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

July 1998

Price Group 4

Textile Materials for Aerospace Purposes Sectional Committee, TX 13

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Textile Materials for Aerospace Purposes Sectional Committee had been approved by the Textile Division Council.

This standard, which was first published in 1967 and subsequently revised in 1981, has been taken up for revision to cover various varieties of nylon braided cords specified in different specifications laid down by Controllerate of Quality Assurance Textiles and Clothing, Kanpur and Aerial Delivery Research and Development Establishment, Agra, Ministry of Defence in a single standard. Accordingly this revision amalgamates IS 4437 : 1973 'Braided nylon cords for personnel parachutes (*first revision*)'.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

TEXTILES — BRAIDED NYLON CORDS FOR AEROSPACE PURPOSES — SPECIFICATION

(Second Revision)

1 SCOPE

1.1 This standard prescribes the constructional details and other requirements of different varieties of scoured and/or dyed nylon cords intended for use in parachutes and in the allied aerial delivery equipments and systems.

1.2 This standard does not specify the type of shade, finish, feel, etc, of the cords (*see also* **4.5**).

2 REFERENCES

The standards listed at Annex A are necessary adjuncts to this standard.

3 MANUFACTURE

3.1 Yarn

3.1.1 The continuous multifilament, bright, high tenacity nylon 6 or nylon 66 yarn shall be used in the manufacture of cords. The linear density of yarns in the core and sheath together with their construction is given in Table 1. The plied yarn shall be twisted as per **3.1.2**.

NOTE — In order to ascertain whether nylon type 66 or 6 yarn is used, the method of test for the determination of melting point in accordance with IS 5762 may be followed. The melting point of nylon 66 and nylon 6 shall not be less than 247°C and 215°C respectively.

3.1.2 The single yarns shall be suitably doubled and twisted together so that the product complies with the requirements of this standard. The turns per metre (tpm) in the individual yarns except for the Varieties No. 11 and 12 shall be as follows:

Nominal Count	tpm *(Final)*
70 dtex × 6	280 ± 10 percent
235 dtex × 2	320 ± 10 percent
235 dtex × 3 × 3	340 ± 10 percent
235 dtex × 5 × 3	280 ± 10 percent
235 dtex × 6 × 3	200 ± 10 percent
940 dtex × 2	160 ± 10 percent
940 dtex × 3	160 ± 10 percent

3.1.2.1 The turns per metre (tpm) for Varieties No. 11 and 12 shall be as follows:

Yarn	*Single Twist*	*Ply Twist (Initial)*	*Ply Twist (Final)*
Sheath	330 ± 15 percent	—	240 ± 15 percent
Core	40 (Approx)	520 ± 15 percent	280 ± 15 percent

3.2 Cord

3.2.1 The cord shall be tightly formed in braided construction having uniform tension throughout its length. The core and sheath shall be well formed and free from knots, slubs or stains. The finished cord shall be of uniform round cross-section, clean, smooth to handle and free from all manufacturing defects.

3.2.2 The cords meant for use in personnel parachutes shall be identified by the inclusion of one black coloured thread in the braiding. The black colour of the thread shall be obtained by dyeing with acid type dyes.

4 REQUIREMENTS

4.1 Construction

The cords shall conform to the requirements specified in Table 1.

4.2 Slackness of Sheath and Core Looping Tendency

The cords shall be free from slackness of sheath and core looping tendency when tested by the method prescribed in Annex B.

4.3 Length

The length of cord in a ball, hank or bobbin shall be as agreed to between the buyer and the seller. The length shall be determined in accordance with IS 7071 (Part 1).

Table 1 Requirements of Braided Nylon Cords/Cordages

(*Clauses* 3.1.1, 4.1 *and* 10.1.1)

Variety No.	Nominal Linear Density of Yarn (dtex)		No. of Spindles	No. of Ends		Plaits per Decimetre	Mass *Max* g/100 m	Breaking Load on 15 cm Test Length, *N*	Elongation at Break, *Min* Percent
	Core	Sheath		Sheath	Core				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	—	70×4 to 6 or 35×2×4 to 6	16	16	—	90 ± 10	76	246 ± 20	25
2	—	330×3 or 165×2×3	8	8	—	51 ± 1	91	295, *Min*	25
3	—	235×1	16	32	—	90 ± 10	91	345, *Min*	20
4	—	Alternate ends of 235×1 and 235×2	32	32	—	105 ± 5	137	500, *Min*	20
5	235×3×3	235	16	32	2	70 ± 10	140	492 ± 40	25
6	—	Alternate ends of 235×3 and 235×4	16	16	—	80 ± 10	170	740 ± 70	25
7	235×3×3	235×2	16	32	2	62 ± 8	270	980 ± 90	25
8	—	1 400	16	16	—	65 ± 5	315	1 000, *Min*	20
9	—	940 × 2	16	16	—	40 ± 1	320	1 375, *Min*	23
10	940×3	12 ends of 940×2 4 ends of 940×3	16	16	3	47 ± 4	555	1 785, *Min*	25
10A	235×3×3	235×3×3	16	16	4				
11	235×5×3	235×1×3	32	32	7	105 ± 5	570	1 785, *Min*	30
12	235×5×3	235×1×3	32	32	9	105 ± 5	665	2 452, *Min*	30
13	235×6×3	235×3×3	16	32	4	43 ± 4	1 110	3 120, *Min*	25
14	940×3 or 235×6×2	32 ends of 940×3 and 16 ends of 940×2 or 235×3×3	16	48	4-6	27 ± 4	1 665	5 335, *Min*	25
15	—	940×9 for golden 940×12 for white (each spindle contains 2 golden and 3 white threads)	8	40	—	10	5 000	12 740, *Min*	25
Methods of Test			Visual	Annex D		IS 7071 (Part 4) : 1986			

4.4 The cords shall also conform to the requirements specified below:

Sl No.	*Characteristics*	*Requirements*	*Methods of Test, Ref to IS*
i)	*p*H value of aqueous extract	5.5 to 8	1390 (Cold methods)
ii)	Colour fastness to (in case of coloured cords):		
	a) Light	5 or better	686 or 2454
	b) Washing : Test 3	4 or better	764

NOTES

1 In case of dispute IS 686 shall be followed for determination of colour fastness to light.

2 Metallized/chrome dyes shall not be used in the production of dyed cords.

4.5 Sealed Sample

4.5.1 In order to illustrate the pattern, workmanship, etc, of the cord, if a sample has been agreed upon and sealed, the supply shall also be in conformity with the sample in such respect.

4.5.2 The custody of the sealed sample shall be a matter of prior agreement between the buyer and the seller.

5 INSPECTION

5.1 Freedom from Defects

Yarn contained in each unit of ball/hank/bobbin shall be visually examined, metre by metre, for the defects specified in Annex C. No ball/hank/bobbin shall contain more than five major defects per 100 m. The unit of the product for examination shall be one linear metre. For each unit of product, the defects shall be counted as follows:

a) One major defect along with one or more minor defects shall be counted as one major defect.

b) Three or more minor defects shall be counted as one major defect.

c) One or more major defects shall be counted as one major defect.

d) A continuous major defect shall be counted as one major defect for each unit of product or fraction thereof in which it occurs.

5.2 Each major defect shall be flagged by a red string sewn in the cord. Three minor defects occurring per linear metre shall be flagged by a red string sewn in the selvedge. One metre allowance shall be made for each major defect flagged except for continuous defect which shall be given a two metre allowance for each metre in which defect occurs.

5.3 Each ball/hank/bobbin of supply shall be continuous, without joints, of length not less than what has been specified or agreed upon between the buyer and the seller.

5.4 Overall Examination

Each ball/hank/bobbin shall be visually examined for overall defects as follows:

a) Spottiness, poor penetration of dye or off-shade;

b) Uneven braiding throughout; and

c) Unevenness and streakiness of dyeing in excess of that shown by sealed sample (*see* **4.4**) for appearance.

6 PACKAGING

6.1 The cord of varieties 8 to 13 shall be wound in the form of continuous length, knot-free balls or hanks. The other varieties shall be supplied in knot-free continuous length on flanged bobbins. The length of cord to be contained in a ball or hank or bobbins shall be as agreed to between the buyer and the seller.

6.1.1 Each ball or hank shall be packed in a polyethylene bag which shall be heat sealed. The bags shall be wrapped in polyethylene film to form a pack.

6.1.2 Each bobbin shall be wrapped with tissue paper and five such bobbins shall be packed in a polyethylene bag which shall be heat sealed to form a pack.

7 MARKING

7.1 Each pack shall be tied with a suitable label on which the following information shall be marked:

a) Name of the material,

b) Variety No.,

c) Length,

d) Indication of the source of manufacture,

e) Month and year of manufacture, and

f) Any other information required by the buyer.

7.2 BIS Certification Marking

The product may also be marked with Standard Mark.

7.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be be obtained from the Bureau of Indian Standards.

8 PACKING

8.1 An appropriate number of packages shall be placed in a corrugated cardboard carton or in a wooden packing case conforming either to style 2(b) or 3(b) of IS 1503 previously covered with one layer of low density polyethylene film of 40μm thickness and conforming to IS 2508 first and then wrapped with one layer of waterproof packing paper conforming to Type I of IS 1398. The voids in the carton or case if any, shall be stuffed with paper cuttings to prevent movement of the contents of the carton or case. The lid shall be nailed to the case and the case bound at two places by baling hoopsropes or wire rope of adequate strength and in the case of cardboard carton the sample shall be bound by suitable strappings.

8.2 The gross mass of the case or carton shall not exceed 100 kg.

9 SAMPLING

9.1 Lot

All the balls, hanks or bobbins of the cords manufactured from the same type of yarn and of same form of construction and finish delivered to a buyer against one despatch note shall constitute the lot.

9.2 Each ball, hank or bobbin of the lot shall be tested for breaking load and elongation at break and also inspected for defects.

9.3 The number of balls, hanks or bobbins to be selected at random from each lot for requirements other than breaking load and elongation shall be in accordance with Table 2.

9.3.1 The balls/hanks/bobbins selected according to **9.3** shall constitute the test sample for test.

Table 2 Sampling Plan

(*Clause* 9.3)

Lot Size (Number of Balls/ Hanks/Bobbins)	Sample Size
Up to 25	3
26 to 50	8
51 " 90	13
91 " 150	20
151 " 280	32
281 " 500	50
501 " 1 200	80
1 201 " 3 200	125

9.3.2 One specimen of 5 metres in length shall be drawn from each sample obtained as per **9.3** and **9.3.1** for carrying out the following tests:

a) Mass;

b) Plaits/dm;

c) Number of spindles and threads (in core and sheath, separately); and

d) Slackness of sheath and core looping tendency.

10 CRITERIA FOR CONFORMITY

10.1 The lot shall be declared conforming to the requirements of this standard, if the conditions given in **10.1.1** and **10.1.2** are satisfied.

10.1.1 The average of the observed values of breaking load shall be within the limit specified. No individual reading shall be less than 95 percent of the minimum value specified under col 9 of Table 1.

10.1.2 All the test specimens tested for the remaining characteristics shall also satisfy the relevant requirements.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
196 : 1966	Atmospheric conditions for testing (*revised*)
686 : 1985	Method for determination of colour fastness of textile materials to daylight (*first revision*)
764 : 1979	Method for determination of colour fastness of textile materials to washing : Test 3 (*second revision*)
1390 : 1988	Methods for determination of *p*H value of aqueous extracts of textile materials (*first revision*)
1398 : 1982	Packing paper, water proof, bitumen laminated (*second revision*)
1503 : 1988	Wooden packing cases (*third revision*)
2454 : 1985	Methods for determination of colour fastness of textile materials to artificial light (xenon lamp) (*first revision*)
2508 : 1984	Low density polyethylene film (*second revision*)
5762 : 1970	Methods for determination of melting point and melting range
7071 (Parts 1 to 3) : 1989	Ropes and cordages : Parts 1 to 3 Methods of physical test (*first revision*)
7071 (Part 4) : 1986	Methods of physical tests for ropes and cordages : Part 4 Breaking load and elongation at break

ANNEX B

(*Clause* 4.2)

METHOD FOR DETERMINATION OF SHEATH SLACKNESS AND CORE LOOPING TENDENCY

B-1 TEST SPECIMENS

For the purpose of this test, a piece of cord approximately 2 m in length, cut from each ball or hank in the test sample shall constitute the test specimens.

B-2 PROCEDURE

B-2.1 Take one test specimen and knot it firmly at both the ends. Make a mark on the test specimen at a distance of 2.5 cm from one of the knots.

B-2.2 Starting from the other knot on the test specimen, pass it between the thumb and finger of one hand by using firm pressure so as to slide the sheath towards the marked end.

B-2.3 Observe the position of the mark and note the displacement of the mark, if any.

B-2.4 Now fold the test specimen, making it into loops of about 8 cm length, so that it may be conveniently held in one hand.

B-2.5 Hold the looped test specimen in one hand and impart rotatory rubbing motion to it by the other hand, applying medium pressure. Continue the rubbing at the rate of one rub per second until a total of 60 rubs are imparted.

B-2.6 After 60 rubs, observe the test specimen for any penetration on the sheath by the core threads.

B-2.7 If there is no penetration of the sheath by the

core threads, but bulges or nodules are observed on the test specimen, take two further test specimens and treat them in the same manner as prescribed in **B-2.4**.

B-2.8 Observe the two test specimens for any sign of core thread having penetrated the sheath.

B-2.9 Repeat the test with the remaining test specimens.

ANNEX C

(*Clause* 5.1)

CLASSIFICATION OF DEFECTS

	Type of Defects	*Description*	*Major*	*Minor*
a)	Abrasion marks	Resulting in rupture of individual yarns or plies, distortion in the orientation of threads, areas noticeably thinner than adjoining un-effected areas, or in nap sufficient to obscure the identity of the filaments in any yarn.	X	
b)	Broken or missing ends	Any broken end projecting from surface of the cord, missing ends.	X	
c)	Coarse or heavy ends (per 20 linear meters)	More than 2 ends up to 2 ends	X	X
d)	Light or fine ends (per 20 linear meters)	More than 2 ends up to 2 ends	X	X
e)	Core end protruded	Any	X	
f)	Heavy, thick, or hard places, or uneven plaits	Over 10 percent increase over maximum in plaiting or over 5 cm of increased plaits	X	
		10 percent increase over maximum in plaiting for 5 cm	X	
g)	Holes	Any	X	
h)	Kinks, loose, popped out core	Any	X	
j)	Kinks, loops, snarls, slack or loose ends (per 10 linear metres)	More than 1	X	
k)	Knots in plied yarn (per 10 linear metres)	More than 1 knot in sheath yarns	X	
		Any knot in core,		X
		1 knot in sheath yarns	X	

CLASSIFICATION OF DEFECTS — *Continued*

	Type of Defects	*Description*	*Major*	*Minor*
m)	Lapping of core ends	More than 25 cm in length	X	
		25 cm or less in length		X
n)	Missing core ends	Any	X	
p)	Tight ends (per 10 linear metres)	More than 1 end 2 m long	X	
		1 end 2 m long		X
q)	Identification yarn (when applicable)	Omitted	X	

ANNEX D

(*Table* 1)

METHOD FOR DETERMINATION OF PLAITS PER DECIMETRE

D-1 TEST SPECIMENS

D-1.1 For the purpose of this test, a length of cord measuring approximately 100 cm cut from each ball or hank in the test sample shall constitute the test specimens .

D-2 CONDITIONING OF TEST SPECIMENS

D-2.1 Prior to test, the test specimens shall be conditioned in a standard atmosphere at 65 ± 2 percent RH and 27 ± 2°C temperature (*see* IS 196) for at least 24 hours.

D-3 PROCEDURE

D-3.1 Take a test specimen and apply a tension equal to 1 percent of minimum breaking load of the cord (*see* Note). After 60 ± 5 seconds, mark in the length in tension of five separate one decimetre specimens.

NOTE — The tension may be applied in a breaking load testing machine. Alternatively it may also be applied by fixing one end of the cord to a peg and passing the cord around a pulley and hanging the desired load at the other end.

D-3.2 Release the load and count the number of plaits in each decimetre specimen and calculate the average plaits per decimetre.

D-3.3 Repeat the test with the remaining test specimens.

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